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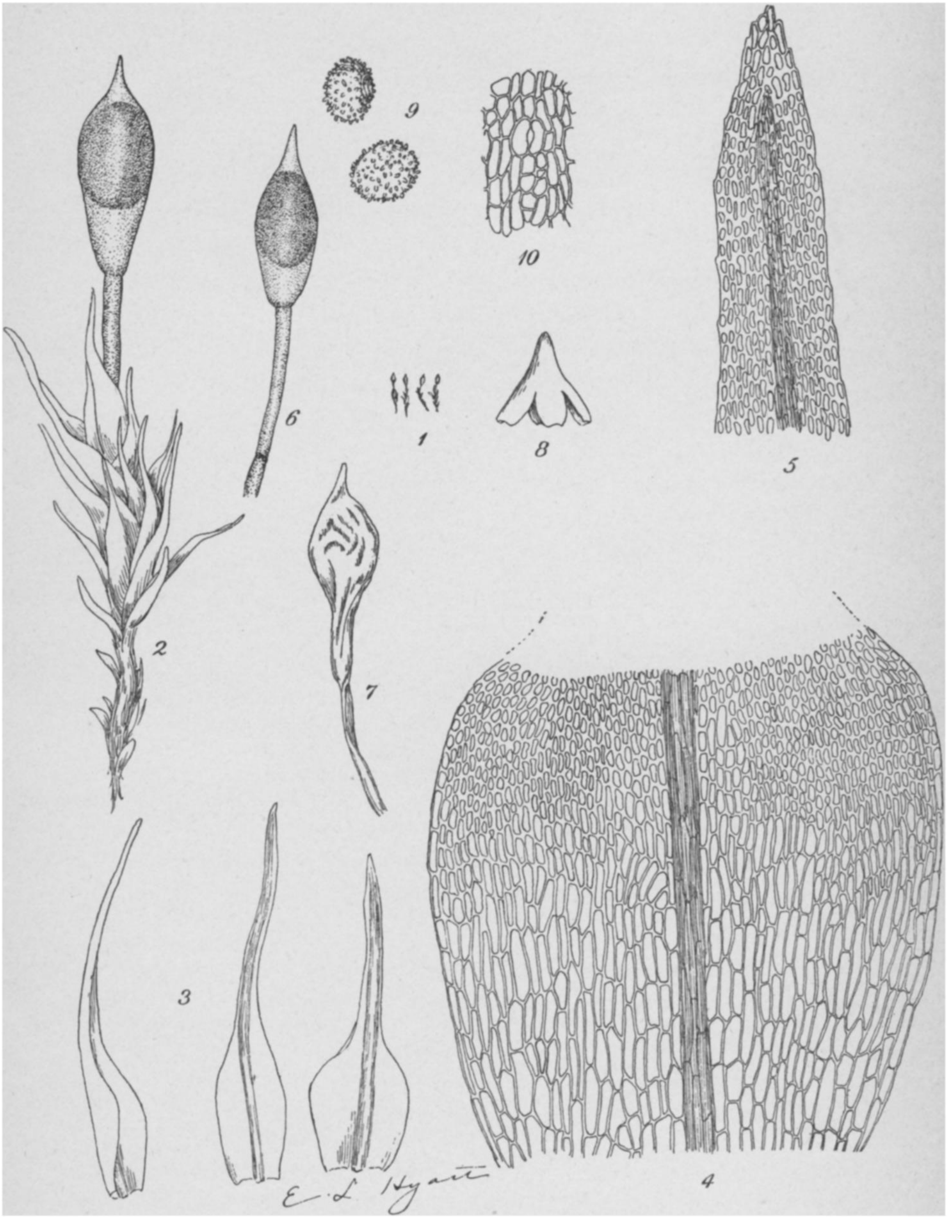
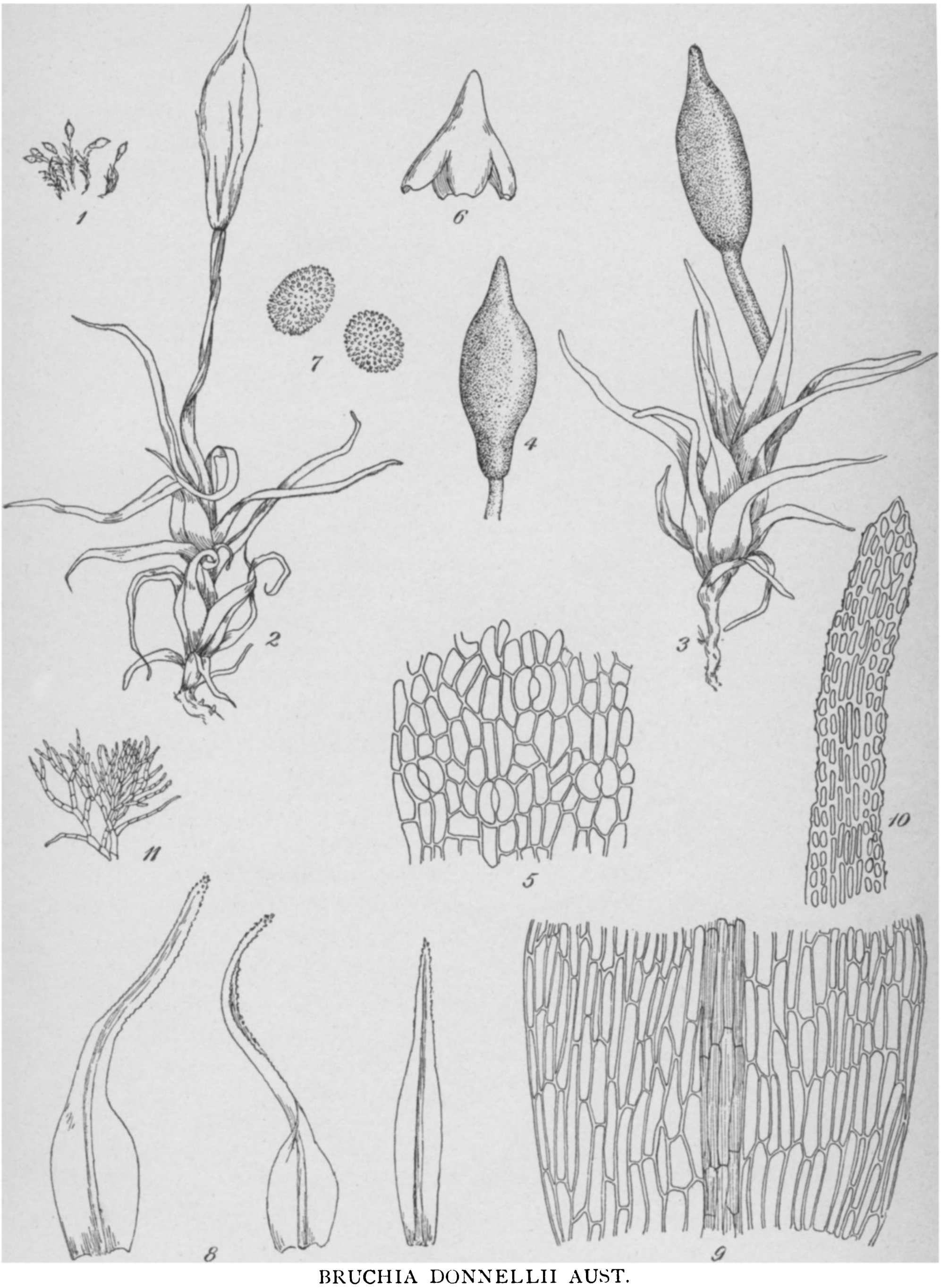
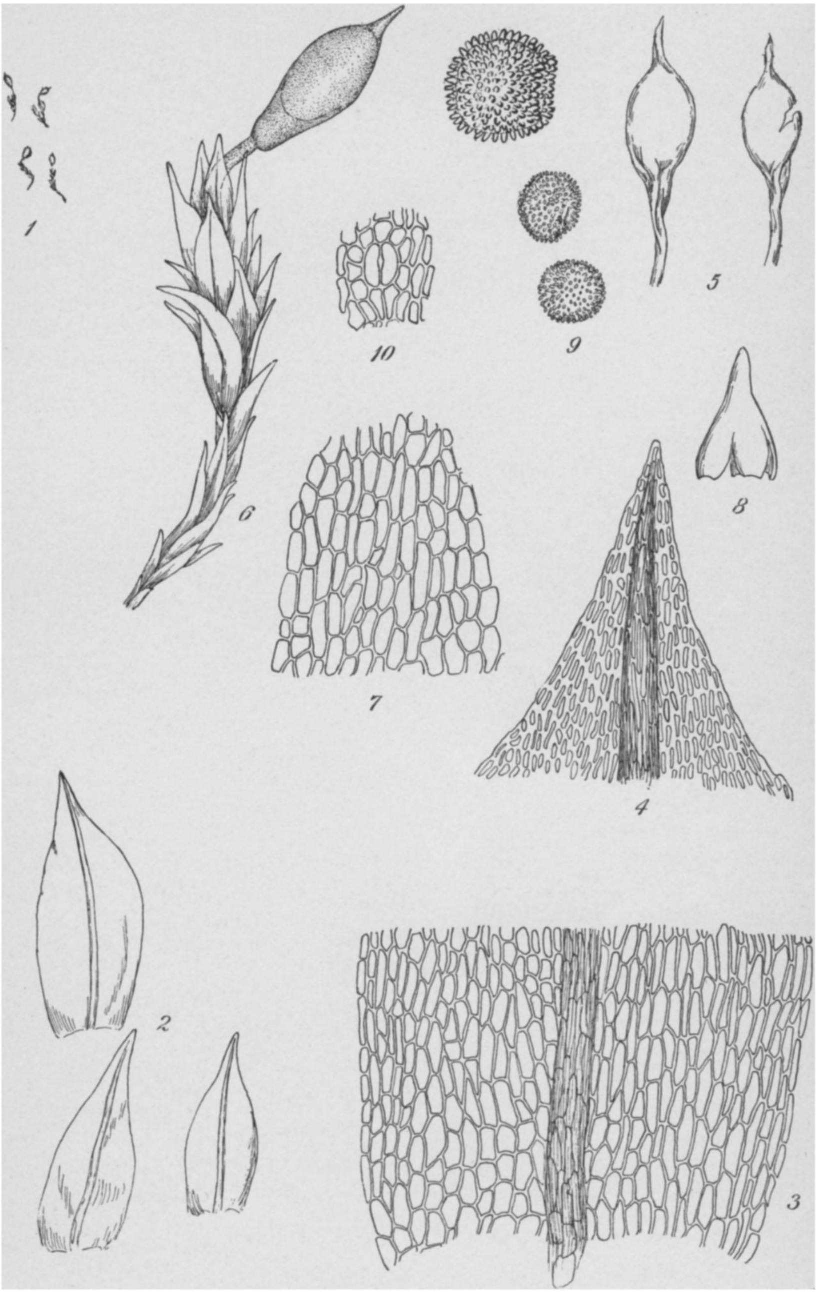
BULLETIN OF THE TORREY BOTANICAL CLUB.—PLATE 213.



BRUCHIA TEXANA AUST.

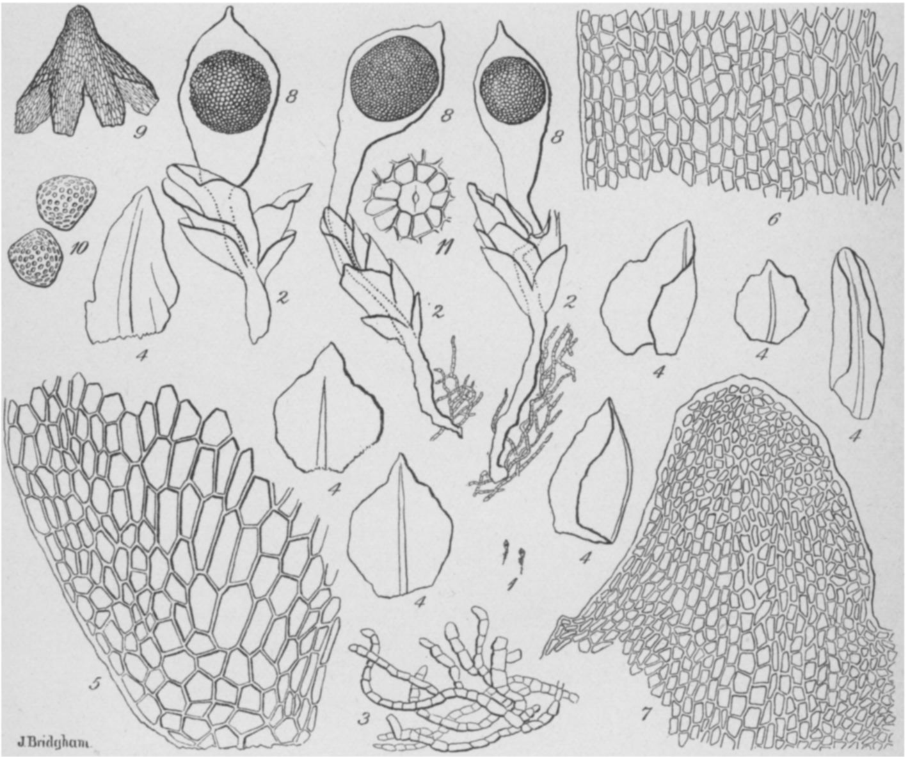


BRUCHIA DONNELLII AUST.



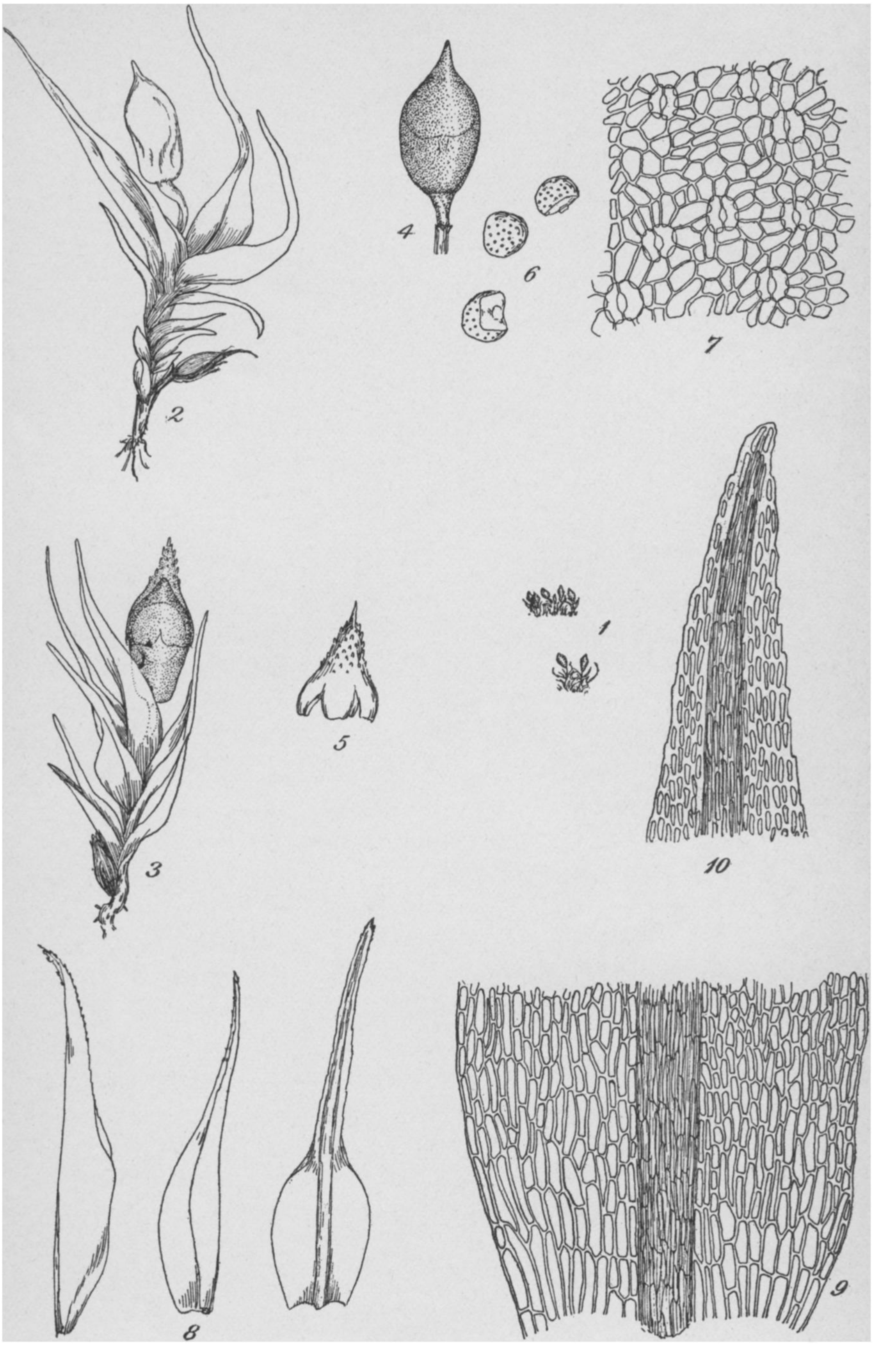
BRUCHIA HALLII AUST.

BULLETIN OF THE TORREY BOTANICAL CLUB.—PLATE 216.



BRUCHIA FUSCA E. G. BRITTON.

BULLETIN OF THE TORREY BOTANICAL CLUB.—PLATE 217.



BRUCHIA CAROLINÆ AUST.

Zea canina, as grown at Cambridge by Professor Watson, was ten feet tall, and suckered greatly ; as grown by Harshberger, at Philadelphia, it was but five feet tall, and tillering is neither noted nor figured. Moisture seems to develop height, aridity to dwarf. When weeds, the great robbers of moisture from land, are allowed to develop freely in a cornfield, a moist spot will frequently bear corn of the normal height, while a neighboring drier hillock yields only dwarfed and stunted specimens. On the other hand some varieties seem to remain dwarf under all conditions observed. The tallest forms are recorded from hot and moist tropical regions, but so also are low-growing varieties.

Contributions to American Bryology.—VIII.

By Elizabeth G. Britton.

A REVISION OF THE GENUS BRUCHIA, WITH DESCRIPTIONS OF TYPES, AND ONE NEW SPECIES.

(Plates 213–217.)

BRUCHIA Schwægr. Suppl. **2**: 91 (1824).
PHASCUM Schreb. De Phasco Obs. (1770) in part.
SPORLEDERA Hampe, Linnæa, 279 (1837).

The genus *Bruchia* was founded by Schwægrichen in 1824 for *B. flexuosa*, which had previously been described under *Phascum* from specimens sent by Muhlenberg. The type species, therefore, is American, and the genus reaches its greatest development in North America, only two European species being so far known. Several have been described from Central and South America, and three from South Africa.

Müller in his Synopsis Muscorum, 1849, recognized 7 species, of which four were American, and subdivided the genus into two sections:

I. Sporledera Hpe. (*B. Beyrichiana, B. palustris, B. brevipes*).
II. Eubruchia. (*B. flexuosa* and var. *minor*).

In the first section he placed the subacaulescent species, and in the second the taller, stemmed species with exserted capsules and long necks.

Jæger, in his Musci Cleistocarpi (1869), recognized two genera.

I. *Sporledera* Hpe. (*S. palustris*, *S. Beyrichiana*, *S. Ravenelii*, and *S. setifolia* from North America, and three exotic species).

II. *Bruchia* Schwægr. (*B. brevipes*, *B. brevifolia*, *B. microcarpa*, *B. flexuosa* and *B. Bolanderi* with four exotic species).

He divided the genus *Bruchia* into two sections:

A. *Garckidium* (*B. brevifolia*, *B. brevipes* and two exotic species).

B. *Eubruchia* (*B. flexuosa*, *B. microcarpa* and *B. Bolanderi* with one of the European species).

When Sullivant's Mosses of the United States was published in 1856, he recognized five species in this genus: *B. flexuosa*, *B. Beyrichiana*, *B. brevipes*, *B. brevifolia*, and *B. Ravenelii*, with *B. palustris* under *Pleuridium*.

In the Icones Muscorum (1864) he figured four of these: *B. flexuosa*, *B. brevipes*, *B. brevifolia*, and *B. Ravenelii*. Of *B. Beyrichiana* he secured an original specimen from Hampe, and states that this species is "an immature state of *B. brevipes*."

In the Supplement to the Icones (1874) he changed his mind about *B. Beyrichiana*, and figured it, not from the original specimens, however, but from those collected by Ravenel on the Santee Canal. He also added *B. Bolanderi*, making six species in all.

Ten years later, in the Manual, Lesquereux and James recognized fourteen species, including *B. palustris*, adding four of Austin's species, *B. Sullivanti*, *B. Hallii*, *B. Donnellii*, *B. Texana*; two of their own, *B. brevicollis* and *B. curviseta*, and a Chilian species which never should have been included, *B. Hampeana* Müller.

Since then Prof. Eaton has described one new species, *B. longicollis*. Illustrations of most of these have been published. Plates of Austin's four species have been drawn for this contribution from the original specimens in his herbarium. *B. curviseta* L. & J. has not been figured, but it is very close to *B. Texana*, and the type specimens in James' Herbarium are not accessible.

In this contribution we have limited the name *B. flexuosa* to the type species, reduced *B. brevicollis* to it, rejected *B. Beyrichiana* as a mixed and uncertain species, limited the name *B. brevipes* to the African species and replaced it for American specimens by *B. Drummondii*, discarded *B. Hampeana*, a Chilian species, maintained

B. Carolinæ, and added *B. fusca* as a new species. Besides this, two other North American species, *B. microcarpa* and *B. setifolia*, still remain uncertain. They were described by Jæger from manuscript names of Wilson, but the specimens in Wilson's Herbarium do not agree with those in Jæger's, and though they probably antedate some of the more recent species, we cannot prove it. We have also learned of another species in the herbarium of Dr. C. Müller, which was collected in Alabama by Dr. Chas. Mohr, whose name it bears, but we have seen no description nor specimens.

It will be seen from the following pages that the specimens and their names have been very much confused, and it has only been through an extensive series of comparisons, drawings and measurements that we have been able to settle a few of the doubtful species.

Through the kindness of M. Eugene Autran and the authorities at Kew and South Kensington I have been able to see all the available European types. By the kindness of Dr. Robinson, Sulivant's whole collection of the genus was placed at my disposal, and Prof. D. C. Eaton also conferred on me a similar favor. Dr. S. E. Jelliffe has verified all my spore measurements.

A thorough examination of the specimens in Wilson's and Hampe's herbaria at South Kensington, London, would probably throw more light on some of the doubtful points, and as we shall show, Dr. Müller could, if he would, settle two others. We still feel that more study is necessary to properly understand the genus, and we would ask collectors in our Southern States to pay particular attention to it, as even yet more new species may be looked for.

Classification.

I. EU-BRUCHIA. Neck of the capsule equal to or shorter than the spore-sac; seta immersed or very slightly exserted; lid not differentiated.

a. Caulescent species.

1. Paroicous Leaves subulate, more or less papillose; spores spinose. (*B. flexuosa*, *B. Sullivanti*, *B. Texana*, *B. curviseta*, *B. Donnellii.*)

2. Autoicous. Leaves short, smooth, erect-appressed, concave, clasping, vein not excurrent into a subulate point; spores reticulate or pitted. (*B. Hallii*, *B. fusca.*)

b. Acaulescent species. Autoicous. Leaves subulate, smooth, serrate or dentate; capsules almost sessile.

1. Spores reticulate. (*B. Drummondii*, *B. Ravenelii.*)

2. Spores pitted. (*B. brevifolia*, *B. Carolinæ.*)

II. TREMATODONTOIDEÆ. Neck of the capsule longer than the spore-sac ; seta much exserted, lid differentiated but not dehiscent. Spores papillose. (*B. Bolanderi*, *B. longicollis.*)

III. SPORLEDERA. Capsule without any neck, rounded at base, immersed on a very short seta; calyptra small apical. (*B. palustris.*)

KEY.

- Neck shorter than the spore-sac, or equal to it; lid undifferentiated ; seta immersed or slightly exserted.
  - Caulescent, paroicous; seta 3–5 mm. long, exserted.
    - Leaves 1–3 mm. long, subulate, awn smooth or papillose.
      - Spores spinose, .025–.035 mm. ; calyptra smooth.
        - Capsule ovoid, neck short, leaves nearly smooth. — 1. *flexuosa.*
        - Capsule elongated, neck long; leaves subpapillose. — 2. *Sullivanti.*
      - Spores reticulate, .035–.045 mm. ; leaves subpapillose.
        - Plants 5 mm. high, seta erect, neck large. — 3. *Texana.*
        - Plants 2–3 mm. high, seta curved, neck contracted. — 4. *curviseta.*
      - Spores papillose, .032–.037 mm. ; leaves papillose. — 5. *Donnellii.*
    - Leaves short, smooth, not subulate, vein ending in or below the apex. Autoicous.
      - Spores papillose, .030–.045 mm.; leaves ovate-lanceolate. — 6. *Hallii.*
      - Spores pitted, .020–.027 mm.; leaves triangular.
        - Apex acuminate, vein percurrent, capsules orange above. — 7. *brevifolia.*
        - Apex blunt, vein ending below it, capsules brown. — 8. *fusca.*
  - Acaulescent, 1–3 mm. high, autoicous; seta and capsule immersed.
    - Spores reticulate, .025–.035 mm. ; capsules orange-colored.
      - Leaves slender, serrate; calyptra smooth. — 9. *Drummondii.*
      - Leaves spinose-serrate; calyptra papillose. — 10. *Ravenelii.*
    - Spores pitted, .024–.027 mm., calyptra papillose. — 11. *Carolinæ.*
- Neck equal to or longer than the spore-sac, lid differentiated but not dehiscent; seta long-exserted. Spores papillose, .020–.025 mm. ; calyptra smooth.
  - Leaves short, acuminate, serrulate; neck abrupt. — 12. *Bolanderi.*
  - Leaves short, subulate; neck tapering. — 13. *longicollis.*
- Neck none, the base of the capsule rounded ; calyptra small, apical. — 14. *palustris.*

1. BRUCHIA FLEXUOSA (Schwægr.) Müller.

Phascum flexuosum Schwægr. Suppl. 2: 1, *t. 101* (1823). excluding *figs. 3 and 8.*

Bruchia flexuosa Müller, Bot. Zeit. 5 : 99 (1847).

Bruchia Beyrichiana Sull. Icon. Suppl. 25, *t. 15* (1874); L. & J. Man. 47 (1884).

Bruchia brevicollis L. & J. Man. 47 (1884).

Phascum flexuosum Sw.; Muhl. Cat. 98 (1813)? Name only.

Muhlenberg's Catalogue cites Swartz as the authority for this species, but without reference, giving the name only. Mr. J. H. Redfield searched, at my request, in Muhlenberg's Herbarium for the specimens, but no mosses could be found in the collection. The specimens he sent to Schwægrichen, which were described and figured in the Supplement must stand as the types, as shown by the following description.

> " *P. flexuosum* Muhlenberg Catalogus Plantar. Americæ Septentr. p. 98.
> " In terra nuda Pensilvaniæ lectum misit beatus Muhlenberg."

These specimens are preserved at the Boissier Herbarium at Geneva, and through the kindness of M. Barbey and M. Autran we have been permitted to examine them.

There are six separate plants, pasted on a sheet of paper, at the botton of which is written, "*Phascum flexuosum* Pensilv.," and above is a drawing of a cucullate calyptra like the one figured in Fig. 8. The plants bearing fruit are three in number, two of them nearly 5 mm. high, with stems simple, the lower leaves rudimentary, the upper crowded around the seta, reaching to the base of the sporange in two of them, and to the apex or a little beyond it in the third, which is less mature than the others. The leaves are erect or slightly secund, 1.5–2 mm. long, slightly broad at base, suddenly contracted into a straight or flexuose awn, roughened on the back by the thickening of the short transverse walls of the vein, serrulate at apex, ending in three longer, clear cells; vein thick, broad, nearly filling the whole of the awn; cells of the basal blade rhomboidal, becoming lax oblong at base, and sometimes serrate at apex, below base of the awn. Monœcious, the antheridia in the axils of the upper leaves, near the perichætium, one or two, without paraphyses. Seta erect or slightly curved (two erect), 2 mm. long, vaginule brown, capsule 1–1.5 mm. long (one immature), yellow, or brown when mature, ovoid, apiculate, beak sharp, straight, neck short, dense, ending abruptly at the base, stomatose, spores ·025–.035 mm., rough, spinose.

The calyptra is not preserved with the type, and the one figured (Schwægr. Suppl. 2: 1, *t. 101, fig. 8*) seems to belong with Fig. 3 to a *Pleuridium* rather than a *Bruchia*. It is described in the text

"Calyptra campanulata, angusta, latere fissa, vix dimidio minor quam capsula."

It is probable that there was a mixture in the original specimen. It should be noted, in support of this view, that the base of the capsule in fig. 3 is abrupt, while in figs. 2 and 7 it has a distinct neck; also that it protrudes laterally and the leaves far overtop it in fig. 3, while in fig. 2 it is almost erect on a slightly curved seta and the leaves reach to its base or only a little beyond it, as in the specimens preserved.

Two other statements in the description contradict each other, and may be verified by the figures and the specimens:

"Caules lineas duas ad quartor alti; pedicellus lineas tres vel quartor emetiens."

The stems are not higher than 5 mm. (4 lines would be 8 mm.) in the specimens, and the pedicels are only 2 mm. long (not 6–8 or 3–4 lines).

BRUCHIA BREVICOLLIS L. & J. Man. 47 (1884).

Bruchia Beyrichiana Sull. Icon. Musc. Suppl. 25, *t. 15* (1874), not Hpe.

In Lesquereux and James' Manual, on page 47, the statement is made that table 15 of Sullivant's Icones Supplement is partly drawn from specimens of *B. brevicollis* L. & J. collected by Ravenel, on the Santee Canal, South Carolina. Hence it became necessary to see Sullivant's specimens. Through the kindness of Dr. Robinson and Mr. Fernald these were sent to me, and I found in the cover all the specimens cited by Sullivant (Icones Suppl. p. 25), including a small portion of the type of *Sporledera Beyrichiana* Hampe, collected by Beyrich, near Baltimore, 1833, and sent to Sullivant by Hampe in 1860. Below the packet Sullivant had written:

"As I supposed, *Sporledera* (*Bruchia*) *Beyrichiana* Hampe is an immature state of *B. brevipes* or *B. flexuosa*. These specimens belong to *B. brevipes*. Schwægrichen's figure is founded on *B. flexuosa*, W. S. S."

This is substantially the opinion he published in the Icones page 24, under *B. brevipes;* later he crossed over these remarks and wrote on the packet "good species," but the description and plate in the Supplement to the Icones were drawn from Ravenel's specimens, as his herbarium shows. He cites the following synonyms and localities:

Sporledera Beyrichiana Hampe, Linn. **20**: 279 (1837).

Phascum Beyrichianum Schwægr. Suppl. **4**: *t. 301* (1842).

Bruchia Beyrichiana Müll. Bot. Zeit. **5**: 99 (1847).

Hab. first found near Baltimore, by Beyrich; Santee Canal, Ravenel; Burlington, New Jersey, James; North Illinois, Dr. G. Vasey.

All of the specimens above cited, except those collected by Ravenel, are immature, but a careful comparison one with another has enabled me, from leaf characters and imperfect fruiting characters, to say that Sullivant was nearer right in his first opinion than in his last, and that most of the description and all of table fifteen in the Icones Supplement were drawn from the only perfect specimens he had, those collected by Ravenel; hence these must be considered the types of *Bruchia Beyrichiana* Sull. They prove also that *B. Beyrichiana* Sull., is quite distinct from *Sporledera Beyrichiana* Hampe. When compared with Hampe's original, Sullivant's specimens are taller and more densely leafy, the stems quite developed, 2 mm. long, several with the leaves and capsules included reaching 4–5 mm. Hampe's are almost acaulescent, with the leaves crowded at the base, the whole plant not attaining 2 mm. in height. The leaves also show a marked difference; Sullivant's are falcate-secund when dry, erect when moist, with a long slender tip entire below, but distinctly serrate at apex, often 6–8 of equal length, crowded at the apex of the stem; Hampe's are flexuous, recurved and twisted, with a longer, broader base and a stouter point, which when highly magnified shows the short transverse walls to be thickened, giving the back of the leaf the appearance of being papillose, whereas Sullivant's are often perfectly smooth, with the same magnification.

Both have erect pedicels, but Sullivant's are exserted, whereas Hampe's are immersed, and the calyptra in the latter is larger and more lobed. Certainly these two are not the same species.

And as *Sporledera Beyrichiana* Hpe. (Linnæa, **9**: 279,), antedates *Bruchia Beyrichiana* Sull. (Icon. Musc. Suppl. 25, *t. 15*,

1874) by thirty-seven years, it is the latter which must change its name, and the former must be dropped, as it is a mixed species founded on immature specimens. Fortunately there is a name which unquestionably belongs to *B. Beyrichiania* Sull., for in the description of it in L. & J. Manual, page 47, they say, "Sull. Icon. Musc. Suppl. 25, *t. 15*, partly made upon specimens of the next species."

The next species is *B. brevicollis* L. & J., founded on specimens collected by H. W. Ravenel, Santee Canal, South Carolina; according to their own citation, the very ones cited by Sullivant in the Icones Supplement under *B. Beyrichiana*. A further comparison of the descriptions in both will show that those in the Manual are transcribed from the Icones with a slightly incorrect modification, and a very imperfect characterization for their new species. Omit the words "its top not surpassing the leaves;" change "partly" to "entirely;" combine the two descriptions, omitting all references to *B. Beyrichiana*, and there will remain a good characterization of Ravenel's specimens, with the additional evidence that the spores are large and rough in Ravenel's specimens and are so figured in the Icones, but no mention is made of them in the Manual.

That Sullivant should have drawn table 15 from several specimens is not probable, and contrary to what we know of his careful methods, furthermore the other specimens referred to in the Icones are preserved in the same cover with the above in Sullivant's Herbarium. Those collected by T. P. James, at Burlington, N. J., are immature, but they do not agree with either of the above, when placed side by side under the same cover-glass. They have leafy stems 2 mm. high, but the leaves are subpapillose, and the pedicels stout and recurved with immersed capsules, not sufficiently matured to show the spores. They are probably immature specimens of *B. Sullivanti* Austin. Dr. George Vasey's specimens from Illinois are also immature, so young that they are still acaulescent, the calyptra is only just formed and the capsule is yet a mere thickening of the stout, curved pedicel. The leaves are subpapillose on the back, and specimens preserved in Austin's Herbarinm, labeled "*Bruchia Beyrichiana*, Ringwood, McHenry Co., Ill., collected by Dr. Geo. Vasey," are corrected by Austin to *B. Sullivanti* Aust. It is evident then that the only specimens in Sullivant's Herbarium from which he could have drawn the figures which were used in the Icones were those collected by Ravenel which Lesquereux and James say are the ones on which they founded *Bruchia brevicollis.*

In order to determime if Ravenel's specimens were sufficiently distinct from the type of *Phascum flexuosum* to maintain *B. brevicollis* as a species, they were placed together and carefully compared.

The best developed specimen of the type is almost an exact counterpart of one of Ravenel's specimens. In both an occasional trace of roughness may be seen on the leaves, although most of them are smooth, slender and subulate; the pedicels are the same in length and position, the capsules smaller, but the proportions of the neck, beak and sporange are the same.

BRUCHIA BEYRICHIANA (Hpe.) Müller.

Sporledera Beyrichiana Hampe, Linnæa, **11**: 279 (1837).

Bruchia Beyrichiana Müll. Bot. Zeit. **5**: 99 (1847). Sull. Mosses U. S. 17 (1856.)

Phascum Beyrichianum Schwægr. Suppl. **4**: *t. 301* (1842).

On page 279 of Linnæa, Hampe says, "Die Capseln sind freilich nicht ausgebildet, aber doch die Form schon zu erkennen." He describes the specimens as follows:

> "Muscus flavescens, *Phasco subulato* simillimis, foliis inferioribus ex basi latiore subulatis nervosis, perichætialibus latioribus et longioribus, complicatis integerrimis secundis vel flexuosis. Capsula oblonga erecta-pedunculata, calyptra campanulata eadem includente."

I have not seen Hampe's own specimen of this species, but the one sent to Sullivant by him is too immature to show even the form of the capsule, for that had not begun to be formed, the calyptra and pedicel being still immersed in the leaves. In fact, the plants had only perfected the calyptras, and are still too young to say whether the pedicels would be erect or curved, though there is a slight twist in the seta just below the calyptra. The other characters have been described in the comparison with *B. Beyrichiana* Sull. given above. The following measurements are placed on record as the earlier descriptions are all too indefinite.

Sporledera Beyrichiana Hpe. l. c.

Almost acaulescent about 2 mm. high, light yellow, with the leaves crowded, sometimes 6–8 of equal length, flexuose, base ½–⅓ the length of the awn, vein broadest where the awn starts, margins sub-serrulate, apex ending in 1–3 larger clearer cells, those of the back of the leaf, subpapillose, by the thickening of the short transverse walls of the cell, seta short, erect, slightly bent at apex, as if becoming arcuate, calyptra large, .075 mm. long, .050 mm. wide, lobes 6–8, not very deep. Capsule and spores not yet formed.

Type locality near Baltimore, Beyrich (1833).

Mr. Anthony Gepp, of South Kensington Museum, sent me copies of drawings from Hampe's specimens made by him and Carl Müller showing that the type is no more developed than the portion of it in Sullivant's Herbarium, hence we shall have to drop *B. Beyrichiana* from the list of North American species, as it is utterly impossible to tell what the character of its capsules or spores might be.

Phascum Beyrichianum Schwægr. Suppl. *t. 301* (1842). The type of this species was sent to us from the Boissier Herbarium and was compared with Hampe's specimens of *Sporledera Beyrichiana*, from Sullivant's Herbarium. I find no record of locality on the sheet other than "Am bor.," though the text says:

> "In America boreali D. Schweinitzio lectum, dedit D. Arnott; *Sporlederam* a Beyrichio Baltimoræ lectam E. Hampe habet."

Evidently then they were not the same specimens nor gathered by the same collector, though Schwægrichen gave his the same specific name and referred Hampe's to it as a synonym. When compared the plants are taller than Hampe's 2–3 mm. high, light yellow, with longer more papillose, twisted leaves, with involute margins, channeled vein, curved pedicel, over 1 mm. high; the capsules still immature, but sufficiently developed to show the long neck of a *Bruchia*. (See Figs. 6–7, *t. 301*). Comparing the plants with Plate 301, the figures which are not correct are Fig. 8, which would seem to belong to an *Orthotrichum*, as the young immature capsules of the type are perfectly smooth, and Fig. 5, of the apex of the leaf, which is too broad and blunt as seen with the improved objectives of modern microscopes, and should be figured with a serrulate tip to agree with type specimens.

Therefore it seems likely that these plants are, as Sullivant supposed (Icon. Musc. 24) immature specimens of *B. Sullivanti* Aust. (*B. flexuosa* Sull.), but they might be *B. curviseta* L. J., which also has a flexuose seta, and subpapillose leaves, and without the mature capsule and spores it will be impossible to refer either of these names to *B. Beyrichiana* Müll. as synonyms, for we should be forfeiting a certainty for an uncertainty, therefore it seems best to drop *B. Beyrichiana* from the list of *Bruchias*, especially as its synonymy is already in a sad state of confusion.

2. BRUCHIA SULLIVANTI Austin.

Bruchia Sullivanti Aust. Bull. Torr. Bot. Club, 6: 143 (1877).

Bruchia flexuosa Sull. Icon. Musc. *t. 13* (1864).

Bruchia flexuosa, of Sullivant's Icones, was believed by Austin to be a mixed species, composed of the true *B. flexuosa* and *B. Sullivanti* Austin, to which he referred the plate in the Icones, but not the description.

Bruchia flexuosa Sulliv. Icones (excl. descript.), *t. 13;* Aust. Musc. Appalach, No. 56; haud Schwægr.

"Statura facieque *Br. flexuosæ*, sed inflorescentia paroica foliis subpapillosis, etc., statim dignoscitur."

"Capsule concolorous, the collum much constricted in drying, pale, yellow, becoming fuscous. Spores minute (about $\frac{1}{750}$—$\frac{1}{900}$ of an inch in diameter), yellow, opaque, papillose. Leaves mostly longer than the pedicel (often over-topping the capsule), more or less papillose above (often very obscurely so), nearly or quite entire. Occurs on damp ground, from New England to Florida and Louisiana."

Such is the description given by Austin, and the localities cited below are too general to indicate what he considered the type of his new species, and his Musci Appalachiani (1870) were issued before the publication of this species. Number 56 of his exsiccatæ, however, may be considered to be *B. Sullivanti*, as shown by specimens in his herbarium, from Closter, the locality given for No. 56. These specimens are labeled "*Bruchia flexuosa*," collected in 1862 near Closter," and below is written "*Br. Sullivanti*." (The first quotation marks are his, and evidently refer to his previous naming of the specimens.)

No. 56 in our herbarium was compared with the type from Geneva, and they show the same differences that Sullivant's specimens do, the longer more flexuose seta, more slender capsule, clearer neck, shorter, more subpapillose leaves. Mixed with Austin's *B. Sullivanti* are specimens which do agree with the type of *Br. flexuosa*, and these are labelled *B. brevicollis* L. & J. Those collected by J. Donnell Smith in Prince Edward County, Va., in 1878, are labelled *B. brevicollis* L. & J., in blue ink, and above Austin has written *B. Sullivanti* var. *brevicollis*, Austin. They differ according to Austin's notes in the plants being "shorter with longer leaves, smooth on the back of the awn, dentate at apex, less canaliculate, with the capsule smaller, shorter beaked, the spores exactly as in *B. Sullivanti*, neck short, opaque. The seta is as often erect and straight as it is bent."

At the foot of the page (BULLETIN, **6**: 143), Austin says:

"The true *Bruchia flexuosa* Schwægr. with autoicous inflorescence and with spores about as in *Br. Sullivanti*, is given in S. & L. Exsic. Ed. 2, n. 41. The specimens were probably collected in Ohio. I have not seen it from any other source."

Austin did not have the type, nor could he have seen it, and he was mistaken in saying "with autoicous inflorescence," for the type, as we have already shown, is paroicous; but the specimens referred to above (No. 41) were examined in our set, compared and drawn side by side with the type, under the camera. The type again has shorter and broader capsule, maintaining the same differences that it does to all the rest of Sullivant's specimens.

And lastly, No. 41 was compared with Austin's 56, and they too both show with a magnification of 300 diameters the same, short, thickened transverse walls on the back of the vein, which gives it the subpapillose appearance.

Bruchia flexuosa Sull. Icon. Musc. 22, *t. 13* (1864).

The specimens found in the cover of *Bruchia flexuosa* sent to me from Sullivant's Herbarium are labelled and numbered as follows:

44. *B. flexuosa*, Texas, Wright, 1845.

60 and 65. *B. flexuosa* Br. & Sch., Lancaster, Ohio, Lesquereux, 1849.

B. flexuosa var. ? Cleveland, Ohio, Dr. Cassell, June, 1856.

B. flexuosa, Columbus, Ohio, Lesquereux, May, 1861.

172. *B. flexuosa*, eight miles below Portsmouth, Va., T. P. James, March, 1867.

173. *B. flexuosa*, near Petersburg, Va., T. P. James, April, 1867.

176. *B. flexuosa* var. *nigricans*? Moyamensing, Philadelphia, Pa., T. P. James, May 30th, 1866.

32. *B. flexuosa* var. *nigricans*. "Spores the same as in the type." Without locality or date, presumably No. 42, S. & L. Musci bor. Am. from Raccoon Mt., Alabama.

There are also three other small packets without locality, date or collector.

Two drawings also are preserved, one of which I cannot satisfactorily match to the specimens. It is labelled "*Bruchia flexuosa*, Hab. Ohio and Southern States, W. S. S., July, 1850," and may have been drawn from one or more specimens.

The other drawing is labelled "*Bruchia flexuosa* var.? Cleveland, Ohio, June, 1856—Dr. Cassell's," the specimens of which are preserved as shown above. These are the ones referred to the variety *nigricans*, in the Mosses of the United States, page 17 (1856), though later in the Icones (1864) he used the drawings made from them to illustrate what he considered the type of the species, though it must be borne in mind that the specimens in Schwægrichen's Herbarium, and not Sullivant's, are the types.

These specimens of Dr. Cassell's, when placed side by side under the same cover with the *type*, show the leaves to be somewhat shorter and broader, *less rough*, the seta also shorter, but the capsule longer and narrower, with a longer beak, and the spores the same in size and roughness. In the original drawing, but omitted from the Icones, the antheridia are indicated in *Figs. 2–3* as naked, in the axils of the leaves below the perichætium, as in *Fig. 13*. *Fig. 4* was added to the Icones, and does not occur in the original drawing. Sullivant has written on the back of the drawing: "I am unable to find any tangible characters to separate these specimens (Cleveland, Dr. Cassell's) from *Bruchia flexuosa*. These specimens are not as slender as usual in *B. flexuosa*, more condensed, pedicel shorter and leaves shorter, etc. The spores .03–.0325–.035 mm. The spores of *B. flexuosa* are the same."

This raises the question as to what specimens Sullivant considered typical; as far as we can learn from his herbarium he had not seen the type specimens. Presumably these would be the specimens which he distributed in 1865 as Number 41 of S. & L.

Musci bor. Am., but without locality. Judging from his herbarium, it must be either the specimens numbered 60 and 65, sent him by Lesquereux, collected at Lancaster, Ohio, in 1849, or those from Columbus, Ohio, May, 1861, also collected and sent to him by Lesquereux; probably the latter, for the second set of these exsiccatæ were put up by Lesquereux, all the duplicate packets bearing his German figures to correspond with the numbers on the tickets. These, too, were compared with the type, and they show the same differences as Dr. Cassell's, even more accentuated. The pedicels are much longer, more exserted and flexuose, the capsules narrower and longer with a longer beak and neck, leaves shorter and more spreading. With the higher powers the walls of the cells on the back of the vein are more thickened than in the type, and the margins are subserrulate. These spores are a little smaller and roughened in the same way as the type. It will be seen, then, that there is not in Sullivant's cover of *B. B. flexuosa* an exact match for the type from Geneva. His specimens all match *B. Sullivanti* Austin, and the specimens in his herbarium which match the types are in the cover of *B. Beyrichiana*, which we have shown he figured in the Supplement to the Icones, plate 15 as that species.

That *B. flexuosa* and *B. Sullivanti* are very closely allied and probably grade into each other is proven by the above comparisons, but that the differences between them are noticeable is shown by the several names which they have given rise to. We think it probable that *B. flexuosa* is a common and variable species, from which *B. Sullivanti* may be separated as of secondary or lower rank.

Bruchia flexuosa var. *nigricans* Sull. Mosses U. S. 17 (1856).

Bruchia nigricans Austin., Bull. Torr. Club, **6**: 143 (1877).

Bruchia Sullivanti var. *nigricans* Lesq. & Jas. Man. 46 (1884).

It should be noted that Sullivant, in the above citation, says: "Whole plant longer; leaves shorter, appressed; spores larger, dark brown. . . . Raccoon Mountains, Alabama, Lesquereux, and 'Cleveland, Ohio, Prof. Cassell.'"

He subsequently figured in the Icones (1864) the last named specimens as the species, as shown above, and referred the specimens from Raccoon Mountains only to the variety. These were distributed as No. 42 of S. & L. Musci Bor. Am. Ed. 2 (1865), of which there is only one specimen preserved in Sullivant's Herbarium bearing a single capsule. The sterile specimens are much more branching than is usual in the genus. Specimens of No. 42 in our herbarium, two sets in the Jæger Herbarium and those in Prof. Eaton's set have been examined and the spores measured. They vary considerably in size. In our set they are larger, .036–.045 mm., rough, though not spinose, and the outlines of the spores is not very regular. In the Jæger sets I find some spores as small as .027–.029 mm., but with same characteristic surface. These latter have the capsules long-beaked, on a curved seta.

The differences, however, do not seem to be sufficient to separate it as a species, and the remarks by James in the Proc. Am. Acad. **14**: 135, 1879, and in the Manual would seem to account for its variation.

"The variety is evidently due to immersion, as higher upon the dry sand of the borders of the depressions the moss gradually assumes its normal form."

3. BRUCHIA TEXANA Aust. Bull. Torr. Bot. Club, **5**: 21 (1874).

(Plate 213.)

Paroicous, the antheridia naked in the axils of the upper leaves. Plants gregarious, light yellow, varying in size at maturity in the same patch, 3–5 mm. high; stems simple, erect, 2–3 mm. high; leaves smaller at base, crowded around the base of the seta, not reaching the capsule, uppermost 1–1.5 mm. long, broadly clasping at base, contracted into a short subulate awn, composed principally of the thick vein, slightly rough on the back, ending below the serrate apex, narrow and distinct at base; cells of the basal lamina oblong and lax below, becoming irregular, crowded, and serrulate along the awn; seta 1–1.5 m. long, erect, or twisted and recurved, exceeding the leaves; capsule 1.5–2 mm. long, bright orange above, with a long, slender beak; neck large, paler, and contracted when dry, abrupt at base and stomatose, half the length of the capsule, calyptra not reaching the neck; spores yellow, spinosely reticulate, .040–.045 mm., maturing in?

Type locality near Houston, Texas, Hall, also collected by Wright in Texas, 1845, in herb Sullivant under *B. flexuosa* (No. 44). Since collected in South Carolina by Ravenel, and Alabama by Chas. Mohr.

Differing from *B. flexuosa* with which it is mixed in Sullivant's and Austin's Herbaria, in the longer seta, shorter leaves, and larger reticulate spores. The specimens credited to Virginia collected by J. D. Smith in Austin's Musci Appalachiani, Supplement, No. 463, are *B. Drummondii* in Austin's Herbarium. *B. curviseta* L. & J., is very closely allied to this species.

4. Bruchia curviseta L. & J.

Bruchia curviseta L. & J. Man. 47 (1824).

B. Vogesiaca var. 2, Drummond's Southern Mosses, No. 15, in part.

B. Texana Austin, Musci Appach. Suppl. No. 463, in part.

The description in the Manual is good, but the following measurements should be added from Drummond's specimens:

Plants short, 2 mm. high, upper leaves 1 mm. long, often reaching to the summit of the capsules; blunt, dentate or serrate at apex; seta short, .0.5–1 mm. often bent abruptly in two directions; capsules small, 1 mm., neck contracted below the spore-sac when dry; spores spinosely reticulate, .032–.040–.045 mm. the reticulations often .008–.013 mm. in size.

Specimens were distributed by Austin in his Musci Appalachiana as No. 463 as *B. Texana,* collected by Ravenel in South Carolina. It is very close to that species but smaller, and the spores are perhaps slightly more distinctly reticulate than in *B. Texana.*

The type locality is uncertain, as two are given. The label of Drummond's No. 15 reads "Louisiana and New Orleans," and the specimens are mixed with *B. brevifolia* Sull. in Sullivant's set, and with that species and two others, *B. Sullivanti* and *B. Drummondii* (*B. brevipes*) in our set.

Austin also had it from Maryland, collected by J. Donnell Smith, labelled *B. Sullivanti,* "spores too large," and from Prince Edward County, Virginia, also from J. Donnell Smith, and from South Carolina, collected by H. W. Ravenel.

5. Bruchia Donnellii Aust.

Bruchia Donnellii Aust. Bull. Torr. Bot. Club, 6: 144 (1877).

(Plate 214.)

Paroicous, the antheridia naked in the axils of the upper leaves. Plants gregarious in light yellowish green patches, 5 mm. high;

stems erect, 3–4 mm. high, slender, flexuose, leafy to base; leaves curled and recurved, spreading when dry, 1.5–2 mm. long, suddenly contracted into a rough subulate apex, from a broad, hyaline clasping base; lower cells smooth, clear, upper papillose by the thickening of the walls, margins more or less recurved and serrate above; seta exserted, erect or curved, 1.5–2 mm. long, capsules nearly 2 mm. long, orange-colored becoming brown, apiculate, beak straight; neck large, half the length of the capsule, tapering, stomatose; calyptra smooth, lobed; spores .032–.037 mm. papillose, maturing in early spring, from February to April.

Collected at Jacksonville and Rosedale, Florida, by J. Donnell Smith, 1877–1878; also at Gainesville, Florida, by C. E. Faxon, and Aiken, South Carolina, by H. W. Ravenel.

Exsiccatæ: Austin Musci App. Supp. 464.
S. & L. Musci Bor. Am. Ed. 2d, No. 41 in part.

Very nearly allied to *B. Texana* and *B. curviseta*, from which it differs in its papillose not reticulate spores and distinctly papillose leaves.

6. BRUCHIA HALLII Aust.

(Plate 215.)

Bruchia Hallii Aust. Bull. Torr. Bot. Club, 5: 21 (1874).

Paroicous, the antheridia axillary in the upper leaves. Plants 4–5 mm. high, gregarious in light green patches; stems simple erect, 2–3 mm. high; leaves erect-appressed, the lower short, the upper not longer than 1 mm., all ovate-lanceolate, entire or serrulate, the vein ending in the acute apex; basal cells larger, very lax, upper fusiform or rhomboidal, marginal elongated, occasionally serrulate; perichætial bracts broader, clasping; seta erect or curved, 1–1.5 mm. long, exserted; capsules 1–1.5 mm. long, brown, pyriform, apiculate, beak long, straight, neck tapering, paler than the brown wall of the upper half of the capsule, stomatose; calyptra smooth, lobed, covering only the upper part of the capsule; spores large, .043–.048 mm., papillose, maturing in February.

Type locality not recorded; collected in Texas by E. Hall, February 23, 1876, growing with *Ditrichum pallidum.*

7. BRUCHIA BREVIFOLIA Sull.

Bruchia brevifolia Sull. Moses. U. S., 17 (1856) Icon. Musc. 25, *t. 15* (1864).

In Sullivant's Herbarium are preserved three sets of specimens as cited by localities in the Icones, and the original drawing of t–15 is also preserved, but it bears no label to indicate from what specimen it was made; it is dated 1857. The specimens issued in Drummond's Southern mosses No. 15, as *Bruchia Vogesiaca* var. 2. Hab. Louisiana and New Orleans, were mixed both in Sullivant's set and ours. Three different species have been separated from it, two new, *B. curviseta* L. & J. Man. 47 (1884), *B. brevifolia* Sull. (1856), and *B. Sullivanti* Austin (*B. flexuosa* Sull.), the last being preserved with *B. brevifolia* in Sullivant's Herbarium, and mixed with it also in our specimen, hence probably the following comparison of Sullivant's. It will be noted that he reiterates the statements made in the Mosses of the United States that the spores are "about the same." This mistake was rectified in the Icones, in tables 13 and 15, Fig. 12, where they differ in one being spinose, the other pitted. In S. and L. Musci Bor. Am. Ed. 2, No. 44, they are young enough to show that four spores are formed in each mother cell.

Bruchia brevifolia (sp. nov. Sulliv).

"Compared with *B. flexuosa*, it is a shorter plant, capsule larger in proportion, more oblong in general outline, not so elliptical, tapering to each end, the operculum shorter, pedical much shorter, not flexuose, scarcely emergent from the perichaetial leaves, which are rigid, erect, connivent, with a much shorter acumination from an oblong more broad obovate sheathing base, the lower stem leaves are triangular, ovate, all with a heavy percurrent costa-reticulation of leaves the same, the spores also about the same, one spore measuring .03 to .03¼ millimeters in diameter. The true *B. flexuosa* is a slender flexuose plant; the *B. brevifolia* is a stiff short stumpy plant.

"*B. brevifolia* is the *B. Vogesiaca* var. 2, No. 15 of Hook. and Wilson in Drummond's Southern Mosses, partly, viz.: the middle specimen in my copy, which see.

"Neither can *B. brevifolia* be considered an immature or young state of *B. flexuosa*, because the capsules and spores are well developed and ripened. *B. flexuosa* preserves its peculiar slender habit in all stages of growth, and in all situations varying, however, a great deal in size; further the two species appear to grow in exactly similar soils.

"*B. brevifolia* is monœcious (see Fig.), the same, however, is the case with *B. flexuosa* notwithstanding Müller Synopsis Musc. says it is dioicous." "W. S. S., July, 1850."

The above comparison would seem to indicate that Sullivant feared the two might be confused, or found in the same localities, but so far as we know, *B. brevifolia* has only been collected in Texas, South Carolina and Louisiana, the latter being the type locality.

8. BRUCHIA FUSCA n. sp.

(Plate 216.)

Autoicous, the antheridia in basal buds; plants gregarious, light yellow or brown, 2–3 mm. high, protonema more or less persistent; stems short, 1–2 mm. long, naked at base, leaves few, three to six, erect-appressed, short, 1 mm. or less, sometimes reaching the base of the capsule, clasping, often broader than long and tricuspidate, entire, or subserrulate with a narrow border of small, retuse cells, apex obtuse, acute or cucullate, vein faint, ending below the apex, or lacking in the lower rudimentary leaves; cells lax at base; seta short, .25–.50 mm. long, immersed or slightly exserted, straight or curved; capsule large and broad, 1–1.5 mm. long, entirely exserted, ovoid-pyriform, suddenly apiculate, neck shorter than, occasionally equalling, the spore-sac, abrupt or tapering to the vaginule; walls of the capsule dense, brown, not transparent, stomata large; calyptra smooth, deeply lobed, half covering the capsule; spores small, .021–.027 mm. brown, angled and pitted, maturing in April.

Growing around quartz pebbles in sandy soil, Maryland, J. Donnell Smith, 1878, also recently collected at the "The Runs, Pine Bluff, North Carolina, April 11, 1891," by Anna H. Searing, M. D., the latter specimens showing the more tapering necks, but agreeing in every other point with those collected by J. D. Smith.

Differing from *B. brevifolia,* to which it had been referred by Austin on account of its short leaves and pitted spores, in the smaller size of the plants, the short, 3-pointed leaves; the vein ceasing below the apex, but more especially in the capsules, which are shorter and broader, brown, not orange-colored, with a shorter neck tapering at the base. From *B. Hallii,* which it resembles in the erect-appressed habit of its leaves, it differs in the shorter seta, longer neck, and the much smaller, pitted spores.

9. BRUCHIA DRUMMONDII Hpe.

Bruchia Drummondii Hpe. in Sched.; Jæger, Musci Cleist. 36 (1869).

Bruchia brevipes Hook. & Wilson in Drummond's Mosses So. U. S. No. 16 (1841).

Bruchia brevipes Sull. Mosses U. S. 17 (1856); Icon. Musc. 24, *t. 14* (1864), non Hooker.

Plants gregarious, glossy, yellow, 3–4 m. high, stems decumbent and naked at base, densely leafy above; leaves 10–15, uppermost often 3 mm. long, erect or subsecund, abruptly contracted from a broad base, less than one-third the length of the slender tip, vein narrow, not occupying all of the serrate, channeled apex, occasionally serrulate on the back; cells narrow, more lax at base. Autoicous, the antheridia in basal buds; seta short, .25–.50 mm. long; capsule erect, immersed or slightly exserted laterally, one or two in the same perichætium, .75 mm. long, apiculate, upper half bright orange-colored, neck shorter, paler, truncate at base; calyptra smooth, lobate; spores .035–.043 mm., reticulate, maturing in March and April.

Type locality, Louisiana, Drummond, on sandy soil; also collected in South Carolina by Ravenel, and near Petersburg, Virginia, by T. P. James.

Differing from Hooker's type of *Bruchia brevipes*, collected by Harvey at the Cape of Good Hope, Africa, in the larger size of the plants, longer more slender leaves, with the vein not occupying all of the apex, the margins distantly but distinctly serrate, larger capsules, and spores which are reticulate, not spinose.

We have received from Mr. Gepp some sketches and notes from Wilson's Herbarium which show that he realized that a mistake had been made in distributing Drummond's specimens under the same name as Harvey's African ones. The following list of manuscript names shows this:

Bruchia flexuosa var. γ.
——— *nana* Wils. mss.
——— *brevipes* H. & W. in Drummd. M. Am.
——— *setacea* Wils. mss.
——— *Drummondii* Wils. mss.

Mr. Gepp notes that the last was used April 7, 1865, and is Wilson's name, though it is the same as the one credited to Hampe in Sched. by Jæger in his Musci Cleistocarpi on page 36 under *B. brevipes.*

Bruchia brevipes Hook. Icon. Plant *t. 231* (1840).

Phascum elegans Hsch. Linnæa 15: 114 (1841).

The plants from which this species was described were collected at the Cape of Good Hope, by Harvey in July 1837, and are preserved at Kew in Hooker's Herbarium. In 1841 Hooker and Wilson distributed as "*Bruchia brevipes* Harvey M. S.," No. 16 of Drummond's Southern Mosses, collected in Louisiana, with the remark "Capsulis sessilibus foliis non crispatis." In September of 1892 we received from the Natural History Museum at South Kensington a duplicate set of Drummond's Southern Mosses, on No. 16 of which I find pencilled *B. Drummondii,* Wilson M. S. I learn from Mr. Wright that "No. 16 of Drummond's second collection bears no note in the Kew set, but has been laid in with *Bruchia flexuosa.* In an index to the set in Wilson's handwriting it is referred to thus: "*Bruchia elegans* Hrsch. 16 '*brevipes*' is crossed out with red ink."

Wilson must have been mistaken, however, for *Phascum elegans,* Hsch. Linnæa, **15** : 114 (1841) was collected at Newland's Cape of Good Hope by Ecklon, and is cited as the same as Hooker's *B. brevipes* (1840), collected by Harvey, and not our American specimens as will be shown below.

Finding that Sullivant (Icon. Musc. p. 24) had not seen Harvey's specimens, I asked for the privilege of seeing Hooker's type, and have compared it critically with Drummond's 16. This comparison proves that they are closely allied, but sufficiently distinct to warrant their separation. At the first glance the aspect of the plants is different, Drummond's being densely gregarious, bright yellowish green and glossy, Harvey's scattered, and dull dark green; in size also they differ, the American plants being throughout from a third to a half larger than the African ones, as the descriptions will show.

Bruchia brevipes Hooker, Icon. Plant, *t. 231* (1840).

Plants scattered, only 2 mm. high, dull dark green, stems simple, erect, leaves 6–10, lanceolate-subulate, longest 2 mm. entire or faintly appressed serrulate, vein broad occupying all of the thick plane apex, or occasionally channeled, and roughened on the back, narrow at the base. Seta short, 25 mm., capsule erect or inclined, almost entirely exserted, .5 mm. long, apiculate and orange colored above; neck short, not conspicuously truncate. Calyptra small, .33 mm., campanulate, (less beaked and lacerate than figured in (t. 231) spores rough, spinose, opaque, yellow, .037–.040 mm., maturing in July (S. Africa). Collected by Harvey along roadside near Newlands, Cape of Good Hope, with *Phascum nervosum.* A specimen was sent by Dr. Ward to Dr. Torrey labelled *Bruchia Bbrevipes* ? C. B. S., W. W. H.

"*Bruchia Drummondii,* Hpe. in Sched," is one of the synonyms cited by Jæger for "*B. brevipes Hook.*" (Musci Cleist. 36, 1869). He limited this name entirely to the American species, and recognized the African as *B. elegans* (Hsch.) citing "*B. brevipes* Hook. e parte" as one of its synonyms. The American specimens should never be cited as *B. brevipes* Hook., but as *B. brevipes* Hooker and Wilson. Müller in his Synopsis Musc. 1: 18, 1849, cites *B. brevipes* Hook. (*B. elegans* Hsch.) correctly, and limits it exclusively to the African species, as we maintain it should be.

10. BRUCHIA RAVENELII Wils.

Bruchia Ravenelii Wilson in Sull. Mosses U. S. 17 (1856). Icones Musc. 26, *t. 16* (1864). Austin Bull. Torr. Club, 6: 144 (1877).

In Sullivant's Herbarium are preserved the specimens from which the original description by Sullivant was drawn and the drawings from which the plate in the Icones (Icon. Musc. 26 *t. 16* 1864) was engraved. They are labelled in the handwriting of Lesquereux "*Bruchia Ravenelii* Wils. mss. from Ravenel to Lesquereux," and all the characters but one agree with the drawings and require no explanations. The spores are figured and described as "papillose," but they are more properly reticulate, with confluent ridges, forming a honey-combed surface, which is distinctly hexagonally indented, the ridges appearing on the edges as Sullivant has figured them, but not so on the surface. They are small .027–.032 mm. and it is only with a magnification of 400 diameters that this can be distinctly seen. The stomata too are worthy of description, being slightly immersed, not very distinct, with the surrounding cells radiating and covering the outlines of the guard cells.

Specimens in Austin's Herbarium, sent to him by T. P. James, collected on the Santee Canal by Ravenel, from the same locality as the type, show also the same characters. He also had specimens from Aiken and the seaboard in South Carolina, from Ravenel, and some from Mobile, Alabama, collected by Charles Mohr.

We have received from Mr. Gepp tracings from a drawing of some specimens in Wilson's Herbarium labelled:

B. microcarpa Wils. mss.

B. setifolia Wils. litt. ad. T. P. James, Feb., 1855.

They are undoubtedly this species as shown by the papillose calyptra and the reticulate spores, with the short immersed capsules, the antheridia in a basal bud and the subulate serrulate leaves. These being only manuscript names in Wilson's Herbarium, do not affect the question of the name, but Jæger's published descriptions under the above names are not so easily disposed of.

11. BRUCHIA CAROLINÆ Aust.

(Plate 217.)

Bruchia Carolinæ Aust. Bull. Torr. Bot. Club, **6**: 144 (1877).

Bruchia Ravenelii Wils., var. *mollis* L. & J. Man. 49 (1884).

Plants gregarious in brown patches, 1 mm., seldom 2 mm. high; stems short, .5–1 mm. high, naked and radiculose at base; leaves crowded at the summit, more or less secund, 1 rarely 2 mm. long, subulate from a broader base; vein channeled, filling the entire or serrulate apex, faintly papillose on the back; basal cells smooth, irregular, upper with thickened walls. Autoicous, the antheridia in brown basal buds. Seta shorter than the capsules, both immersed, or the capsules occasionally exserted laterally, .5–.75 mm. long, pyriform, yellow or brown, conic apiculate; neck large, truncate, stomata immersed, the guard cells covered by the radiating cells around them; calyptra broad, lobed, papillose at apex; spores small, .021–.027 mm., pitted, maturing in February and March.

Type locality, Aiken, South Carolina, H. W. Ravenel, 1872. Exsiccatæ: Austin Musci App. Supp. 461 (1878), also mixed with *B. Drummondii*, in Drummond's Southern Mosses, No. 16 (1841), in our set; also with *B. brevifolia* in S. & L. Musci Bor. Am. Ed. 2, No. 44 (1865).

Differs from *B. Ravenelii* in its pitted spores and smaller size, from *B. brevifolia* and *B. fusca* in its papillose calyptra and subulate leaves, and from *B. brevipes* in its spores and calyptra.

The types of this species are preserved in the herbarium of C. F. Austin at Columbia College. They have been compared with type specimens of *B. Ravenelii* in Sullivant's Herbarium and with Austin's specimens of this species, as well as with No. 43 of Sull. & Lesq. Musci Bor. Am., Ed. II. and Austin's Musci App. No. 460 and his description in the BULLETIN. The comparisons which he makes there are conclusive that these two must be held as distinct species; that is if spore-characters, aside from all others, are of any value in classification, for the spores of *B. Carolinæ* are as distinctly pitted as those of *B. brevifolia* (Sull. Icon. *t. 15, fig. 12*), while those of *B. Ravenelii* are reticulated with crests as described above. Other differences are evident on careful comparison. The plants are smaller, the capsules less immersed, the calyptra less papillose, the beak longer and more conic, the neck longer and clearer and the spores smaller. The leaves are variable in length, sometimes not reaching the base of the capsule, at others far overtopping it, with the seta erect or curved and the capsules protruding laterally or immersed.

Austin says that the inflorescence may be either synœcious or occasionally autoicous. The type specimens and all the others I have examined show the antheridia in small basal buds, easily distinguished by their darker color.

In Sullivant's Herbarium it is mixed with the specimens which he figured for *B. Drummondii*, Hpe. (*B. brevipes* Hook. & Wilson), but we have compared the figures in the Icones (t. 14), and they all seem to have been drawn from the larger specimens.

UNCERTAIN OR REJECTED SPECIES AND VARIETIES.

Bruchia flexuosa var. *minor* C. Müller, Syn. Musc. **1**: 20 (1849).

Müller, says in the original description as compared with *B. flexuosa* :

> "In partibus omnibus minor, foliis brevioribus strictioribus angustioribus, apice hyalino.
>
> "*β*. Florida: Schimp. sub nomino *Bruchia brevipedis* Hook. in herb. Hampeano."

Sullivant in the Icones (1864) cites this variety as one of the synonyms of *B. brevipes*, but makes a mistake in the specific name, and in the number (15) of Drummond's exsiccatæ. *B. brevipes* was distributed as No. 16.

Jæger in his Musci Cleistocarpi, p. 36 (1869), cites this variety also as a synonym of *B. brevipes*, and adds *B. Drummondii* Hpe. in Sched., citing the specimens distributed in S. & L. Musci Bor. Am. No. 45, which were issued as *B. brevipes* Hook.

Jæger's Herbarium contained two sets of S. & L. cited above, and another specimen of *B. brevipes* from South Carolina, sent him by Dr. Döring, which are correctly named. The other two specimens are labelled "*B. brevipes* Sch." One is from Florida, "Ex. herb. C. Müller, 1865;" they are not *B. brevipes*, but seem referable to *B. curviseta* L. & J., and are probably the specimens described as var. *minor* by Müller, as the localities are the same. The other specimen, labelled "*B. brevipes* Sch.," has been corrected in Jæger's handwriting to "*B. flexuosa* C. M. var. *minor*," and these specimens are *B. brevifolia* Sull. They were collected in South Carolina and sent to Jæger by Schimper from the herbarium of Dr. Swartz, 1862.

It will be seen from the original description and this mixture of specimens that we do not yet know what the var. *minor* is, and Dr. Müller is the only one who can tell us. According to the Jæger Herbarium it may antedate either *B. curviseta* L. & J. or *B. brevifolia* Sull., though we are more inclined to think it is the former. According to Jæger's Musci Cleistocarpi, it has priority of 20 years over *B. Drummondii* Hpe., which replaces *B. brevipes* Hook. & Wilson. The original description is absolutely useless in trying to place the specimens, but under the description of *B. flexuosa* he cites Drummond's No. 15, which was distributed as *B. Vogesiaca* var. This specimen in our set contains three species, *B. Drummondii* Hpe., *B. brevifolia* Sull. and *B. curviseta* L. & J.

BRUCHIA SETIFOLIA Jæger.

Sporledera setifolia Wilson (?) in Jæger, Musci Cleist. 35 (1869).

Bruchia setifolia Jæger Adumbratio 1: 224 (1878).

The following is the original description which, as will be shown later, must be credited to Jæger solely, as Wilson is cited with a query, and the specimens and notes in his herbarium, indicate that Jæger was mistaken in crediting this species to him.

> 7. *S. setifolia* (Wils.) habitu præcedenti similis; foliis e basi angustiore longe setaceis nervo latissimo instructis, toto fere margine erose dentatis, capsula elliptica breviter apiculata, calyptra lævi.
>
> *Bruchia setifolia* Wilson in Sched.?
>
> Patria. In Louisiana Americæ septentr. collegit cl. *Drummond.*

It will be noted that the description begins by referring to the previous species, which is *B. Ravenelii*, from which this one differs principally in the smooth calyptra, and the longer, narrower leaves with the margins erose dentate. It does not state whether the seta is short or exserted, but we are to infer that it is the former as in *B. Ravenelii.*

In the Manual on page 46 under *B. flexuosa* we find *Sporledera setifolia* Jæger cited as a synonym of *B. microcarpa* Wils. and Drummond's Musc. Amer. Coll. II., No. 14, and both referred as var. *microcarpa* Wils. to *B. flexuosa.* This is undoubtedly an utter impossibility, as will be seen by comparing Jæger's original descriptions in the Musci Cleistocarpi, as given above. *B. microcarpa* may be, as it is placed next to be *B. flexuosa*, but *B. setifolia*, it is expressly stated, belongs to the acaulescent species, which he grouped under *Sporledera.*

Being curious to learn what connection W. Wilson had with this, though only a manuscript one, I wrote to the authorities at South Kensington, and received the following reply from Mr. Anthony Gepp:

"In answer to your queries about *Bruchia setifolia* and *B. microcarpa* of Wilson, I may say at once that they are identical, and that Jæger is responsible for spreading confusion concerning them. In Wilson's Herbarium there are specimens and drawings marked '*Bruchia microcarpa* Mss. W. W. (*B. setifolia* in litt. ad T. P. James, February 1855), Louisiana, 43.'

"I have made a fresh drawing from typical specimens and enclose a tracing, from which you can draw your own conclusion as to its claim to rank as a species or not. 'Louisiana, 43,' given above are Drummond's locality and collecting number. You now see why T. P. James put *B. setifolia* as a synonym of *B. microcarpa.* Wilson may at one time have referred the plant as a variety to *B. flexuosa*, but at that time he had not broken up *B. flexuosa* in the liberal way that the moderns have done with their better microscopes. You see that the calyptra is rough and the seta short. Jæger's specimen's of *B. setifolia* apear to have been the right plant."

In the Jæger Herbarium there is a specimen labelled "*Bruchia setifolia* Wils. Louisiana, Drummond," without the number of the original set or the name under which it was distributed. These specimens are not very satisfactory, for there are but two capsules, and these had fallen off. No calyptras are preserved, and the seta is so short, or lacking, that only the vaginule remains, so that the capsules appear to have been sessile. The plants are short, less than 3 mm. high, acaulescent, autoicous, the antheridia in basal buds. The leaves are setaceous and secund, 2 mm. long, serrate at apex, smooth on the back or with very slightly protuberant walls. The spores are .032 mm. and distinctly reticulate. The capsules are minute, less than 1 mm. long, ovoid apiculate, with a rounded base and no neck.

We have not been able to place them satisfactorily in any of the species which we now recognize on account of their incomplete state, but we cannot agree with Lesquereux and James in referring them to *B. flexuosa* as a variety, for that species has a distinct stem, and is not autoicous. We think it is more likely to be *B. Drummondii* Hpe. (*B. brevipes* Hook. & Wils.), with which it agrees in being autoicous and acaulescent, and in the reticulate spores, but differs in lacking the short truncate neck, so characteristic of that species. We do not agree with Mr. Gepp in thinking that they are the same as Wilson's specimens, for the description calls for a smooth calyptra and his were rough.

We had thought it possible that it might be *Sporledera palustris*, as that species had a short truncate base to the capsule, without the inflated neck so characteristic of the *Bruchias*, but these specimens are autoicous, whereas *S. palustris* is paroicous and the spores are warty.

BRUCHIA MICROCARPA Wilson in Jæger, Musci Cleist. 37 (1869).

B. flexuosa var. *microcarpa* L. & J. Manual 46 (1884).

The original description given by Jæger, of which the one in the Manual is a translation, reads as follows:

> "Gracillima; foliis e basi latiore angustissime subulatis, nervo lato percursis, toto margine obsolete denticulatis, capsula gracile eleganter pyriformi, longius apiculata, apiculo erecto, pedicello elongata, calyptra tenera lævi.
>
> "*Bruchia microcarpa* Wils. in litt.
>
> "*Patria.* In Louisiana clar. Drummond collegit."

The specimens in Jæger's Herbarium are labelled "*Bruchia microcarpa*, Wilson; Louisiana, Drummond," without any number or indication of what they were called in Drummond's Mosses. They have been examined and compared with other species and agree with *B. brevipes*, distributed in Drummond's Mosses as No.

16, but not with the description cited above. The description of the pedicel as elongated would seem to preclude this. The only other species, then, to which this description seems to fit, would be *B. curviseta* L. & J. This species occurs in several sets of Drummond's Mosses under No. 15, from which it was described and is the only one of Drummond's which had not been definitely named, by number, when the Manual was issued in 1884. It agrees with the description in its small capsules, which are pyriform and exserted on a long pedicel, and also long apiculate, with a smooth calyptra. It is very probable that this species will prove to be Wilson's lost species. We cannot be certain of this, however, as the number cited for *B. microcarpa* by Lesquereux and James is No. 14 of Drummond's Southern Mosses. In our set, which was formerly the property of G. J. Lyon, and came to us recently from South Kensington, on No. 14, there is pencilled above the name under which it was distributed "*B. flexuosa* var. *microcarpa*." These specimens have been examined and agree with *B. Sullivanti* Aust. It therefore seems as if *B. microcapa* Wilson would remain uncertain, as we learn from Wilson's Herbarium at South Kensington that his specimens are *B. Ravenelii*. It is probable that Wilson sent Jæger the specimens preserved in his Herbarium, as he credits the species to Wilson "in litt." in which case it would become one of the synonyms of *B. Drummondi*, this name having priority of place in Jæger's Musci Cleistocarpi; but if it should prove to be the same as *B. Sullivanti* or *B. curviseta* it would replace these names, over which it has priority.

Bruchia Hampeana C. Müller, Syn. Musc. 1: 18 (1849).
Sporledera Schwægrichenii Hpe. in litt. fide Müller l. c.
Bruchia Schwægrichenii Jæger, Musci Cleist. 36 (1869).

The description given by Müller refers only to the Chilian specimens sent him by Hampe from Herb. Schwægrichen, and he cites no North American locality for this species. In a postal card dated March, 1893, he says:

> "*Br. Hampeana* Chilensis in America septentrionalis non occurrit."

On consulting Jæger's description of *B. Schwægrichenii* I find he cited *B. Hampeana* Müller as a synonym, and besides the original Chilian locality says, "in Louisiana cl. Drummond collegit." A comparison of his description of *B. Schwægrichenii* with that of *B. Hampeana* in Lesquereux and James' Manual shows the latter to be a direct translation of the former, and they simply followed Jæger in crediting this species to North America. We have found in the Jæger Herbarium two specimens labelled *B. Hampeana*, collected in Louisiana, one sent to him by Sickenberger, the other by Count Solms. They are both referable to *B. Drummondii* Hpe. (*B. brevipes* Hook. & Wils.), but they are labelled "*B. Hampeana* Sch." This would seem to indicate that there is a name of Schimper's for a North American species which is identical with the name of the Chilian species, but we have not traced this out, it having no bearing on the name. *B. Schwægrichenii*, in Hampe's Herbarium, is also from Chili. It seems evident, then, that Jæger was mistaken in crediting this species to North America. I have not learned whether there are any specimens preserved in the Lesquereux Herbarium of this species, but in a footnote in the Manual they say of the specimens from Louisiana (Drummond) referred to it, that they differ from *B. Ravenelii* "especially in the distinct somewhat long neck of the capsule." It may be that they had specimens of *B. Carolinæ* Austin, which is closely related to *B. Ravenelii*, and differs in this way also. Sullivant says in the Mosses of the United States, page 17 (1856), that *B. Ravenelii* is "very near the Chilian *B. Hampeana* C. Müll."

SPORLEDERA Hampe, Linnæa, 279 (1837).

Char. gen. Theca clausa, calyptra grandis mitræformis vel campanulata integra, "Habitat, propre Baltimore, Americæ Septentrionalis, socie *Phasci subulati*, Schreb. legit. Beyrich, Mai 1833."

This is the description which follows:

Muscus flavescens, *Phasco subulato* simillimis; foliis inferioribus ex basi latiore subulatis nervosis, perichætialibus latioribus et longioribus, complicatis integerrimis secundis vel flexuosis. Capsula oblonga erecta pedunculata, calyptra campulata eam includente.

Then he says: "At first I thought it must be *Phascum flexuosum* of Muhlenberg, but a comparison with Hedwig's specimens in the herbarium of Prof. Schwægrichen, through the kindness of Prof. Kunze, of Leipzig, contradicts this. With *Bruchia*, this Phascaceous moss is not to be united, as it shows an entirely different structure, also it has a multifid calyptra. Our moss has the structure of *Phascum subulatum*, but is so different in the stalked, elongated capsule, and the campanulate calyptra, that I dedicate it to my friend Herr Sporleder, etc."

It will be seen from the above remarks that Hampe was laboring under a mistake when he contrasted the calyptras of *B. flexuosa* with his *Sporledera Beyrichiana*, due to the fact that there is a a mixture in Schwægrichen's Supplement, in the figure of the calyptra of *Phascum flexuosum*. Furthermore, a part of the type specimen from Hampe's Herbarium is preserved in Sullivant's Herbarium, and although they are immature, yet there is no doubt that it is a species of *Bruchia*, closely allied to the type species of the genus *B. flexuosa*, which antedates *S. Beyrichiana* by fourteen years.

The other species, *B. palustris* (Br. & Sch.) C. Müll., which, according to Müller (Syn. Musc. **1**: 19, 1848), was admitted to this genus by Hampe (in litt.), and is so maintained by Limpricht (Rab. Kryptfl. **4**: 204), must either be given a new generic name, or merged into *Bruchia*. The absence of the characteristic neck of *Bruchia* would seem to justify its generic rank; the lobate calyptra throws it out of *Pleuridium*, where Schimper placed it, though it is more liable to be mistaken for *P. subulatum* than for any species of *Bruchia*.

The original description of *Sporledera*, calling as it does, for a "large" calyptra, enclosing the capsule, makes it doubtful whether *Phascum palustre* can be included in this genus. Furthermore, it is a question whether a genus can be maintained for a species subsequently referred to it, when the original species and characters of the genus are referable to an older genus.

Notes on some Exoasceæ of the United States.*

By George F. Atkinson.

Material has accumulated from several years collecting which led me to begin the preparation of a paper on the prunicolous species of the *Exoasceæ* of the United States. Unexpectedly a

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